HISTORY OF SOLAR CAR RACING and the SOLAR CAR CHALLENGE

History of Electric Vehicles

The harnessing of electrical energy is one of mankind's greatest achievements. English chemist John F. Daniell was credited with developing the first "primary" cell, even though his work was a continuation of the research carried out in the late 1700's by Italian scientist Alessandro Volta.

Volta's battery (or galvanic cell), called the "Voltaic Pile," consisted of silver and zinc disks separated with cardboard and soaked in salt water. Daniell's primary cell was more efficient, but French physicist Gaston Plante took this discovery one step further in 1859 with the invention of the lead-acid storage battery. The modern "dry cell" battery was developed just a few years later by another Frenchman, Georges Leclanche.

By 1900, 38% of pleasure cars sold in the U.S. were electrically powered, 22% gasoline-driven, and 40% steam-driven. But steam had had its day, and the wealthy showed an overwhelming admiration for the quietness and simplicity of the electric cars.

The French GBS Electric Car held the world's distance record on a single charge - 290km in 1900. Electric-powered taxis plied the streets of New York, but country trips were a constant problem. With no power source at their country estates to recharge the batteries of their carriages, the wealthy found electric transport had its limitations. The development of the automobile starter motor by Charles Kettering in 1911 ended the electric vehicle's hold on the market place.

The year 1912 was the high point for electric vehicles with almost 34,000 cars, trucks and buses registered for road use. This trend for electric vehicles went downhill from here with only limited use in specialized commercial applications.

In 1967 GM Electrovan was one of the most famous examples of the fuel cell electric vehicle. Using NASA technology, GM engineers developed a means of using a non-liquid membrane and platinum electrodes which acted as a catalyst in the presence of hydrogen and oxygen.

Electric vehicles even made it to the moon with the Apollo 15, 16, and 17 missions. Despite this success, the EV has continued to be plagued with problems that restrict its use, namely cost, range, weight and recharging time. Solutions to these problems are within our grasp, and are presently being implemented in the new electric vehicles rolling off the assembly line.

Storing the Sun's Energy

Photovoltaic cells are constructed of semiconductor materials which can absorb light and convert it to electricity. The term itself is derived from the Greek "photo" meaning light, and "voltaic" from Alessandro Volta.

The most commonly used semiconductor is silicon (sand), one of the most abundant materials on earth. The manufacture of an active silicon cell, at its simplest level, involves growing a crystal of silicon from reservoirs of molten silicon. In its pure form, silicon is somewhat poor in its ability to conduct electricity, therefore it is necessary to add small amounts of impurities. The type of impurity used in this "doping" operation is dependent on whether we want the semiconductor to conduct positive or negative charges.

As a rule, phosphorous will be added to produce a silicon that will conduct negative charges and is referred to as an n-type silicon. The addition of Boron to the silicon will produce the opposite effect, conducting positive charges (hole), and is referred to as a p-type silicon.
Once these two types of silicon have been produced and are layered into a single cell, a junction is formed called the p-n junction. It is at this junction that a voltage potential is developed, similar to that at the terminal of a storage battery.

When sunlight strikes the cell in the vicinity of the p-n junction, each photon generates an electron and a hole. The electron and hole move apart; this movement of charge constitutes an electric current which can be made to do some external work.

Typically, the potential difference in a silicon cell is of the order of 0.5 volts, while the current produced depends on the amount of sunlight, area of the cell, etc. By connecting several cells, in series or parallel, the voltage or current output of the array can be increased. The energy is then stored in batteries.

Today's batteries are rated by their ampere-hour capacity. Generally, 5, 10, or 20 hour rates have been common measures. For example, if a battery is rated at 60 amp/hours at the 20 hour rate, it means that the battery can be discharged at 3 amps for 20 hours without the voltage falling below 1.75 volts per cell, or 10.5 volts in the case of a 12-volt battery.

History of Solar Car Racing

Hans Tholstrup and Larry Perkins pioneered solar car racing when they completed an epic Solar Trek from Perth to Sydney (Australia) in 1983. What followed was a series of solar car races designed to increase public awareness. The 1987 Australian World Solar Challenge saw 23 participants inaugurate the first such race, followed by the European Tour de Sol, The American Tour de Sol, SUNRAYCE, and the American Solar Challenge. Today, The World Solar Challenge, sponsored by South Australia, is the premiere solar car event attracting teams from around the world to race the 1800 miles from Darwin, NT to Adelaide, SA.

Like the electric automobiles of the early 20th Century, a solar car is powered by electricity. Unlike its predecessor, a solar car uses only sunshine for fuel. Photovoltaic cells on the car collect and convert the energy from sunlight directly into electricity, making the vehicle completely self-sufficient.

The main objective of any solar car manufacturer is to build an efficient, reliable vehicle, typically generating 700-1500 watts of power, or about ½ horsepower. This makes aerodynamic drag and rolling resistance critical design considerations.

History of the Solar Car Challenge

In 1993, the Solar Car Team launched an education program to teach high school students how to build and safely race roadworthy solar cars. The Solar Education Program met this objective, and worked to provide curriculum materials, on-site visits, and workshop opportunities for high schools across the country. This program was designed to motivate students in the sciences, engineering, and technology. The end product of each two-year education cycle is the Solar Car Challenge: a closed-track event at the world famous Texas Motor Speedway, or a cross country race designed to give students an opportunity to display their work.

Race History

- 1995 Dallas County Race circling
- 1997 A 600-mile cross country race from Dallas, TX to San Antonio, TX
- 1998 *Closed Track Event* at the Texas Motor Speedway
- 1999 A 1600-mile cross country race from Dallas, TX to Los Angeles, CA
- 2000 *Closed Track Event* at the Texas Motor Speedway
- 2001 A 1400-mile cross country race from Round Rock, TX to Columbus, IN
- 2002 *Closed Track Event* at the Texas Motor Speedway
- 2003 A 1600-mile cross country race from Round Rock, TX to Cocoa, FL
- 2004 *Closed Track Event* at the Texas Motor Speedway
- 2005 A cross country race from Round Rock, TX to Los Angeles, CA
- 2006 *Closed Track Event* at the Texas Motor Speedway
- 2007 A cross country race from Round Rock, TX to New York
- 2008 *Closed Track Event* at the Texas Motor Speedway
- 2009 *Closed Track Event* at the Texas Motor Speedway
- 2010 A cross country race from Dallas, TX to Pueblo, CO
- 2011 *Closed Track Event* at the Texas Motor Speedway
- 2012 *Closed Track Event* at the Texas Motor Speedway
- 2013 A cross country race from Dallas, TX to Los Angeles, CA
- 2014 A hybrid event: Texas Motor Speedway and cross-country from Fort Worth to Austin, TX
- 2015 *Closed Track Event* at the Texas Motor Speedway
- 2016 A cross-country race from Fort Worth, TX to Minneapolis, MN

Former national sponsors for the Solar Car Challenge: Hunt Oil Company, Dell Computers, Green Mountain Energy, The Acclivus Corporation, and Austin Energy. The Solar Car Challenge is recognized by the IRS as a 501(c)(3) non-profit educational organization.